M ath P ractice Section 3: H ard D ifficult

M ath P ractice Section:
H ard 20 Q uestions
35 M inutes

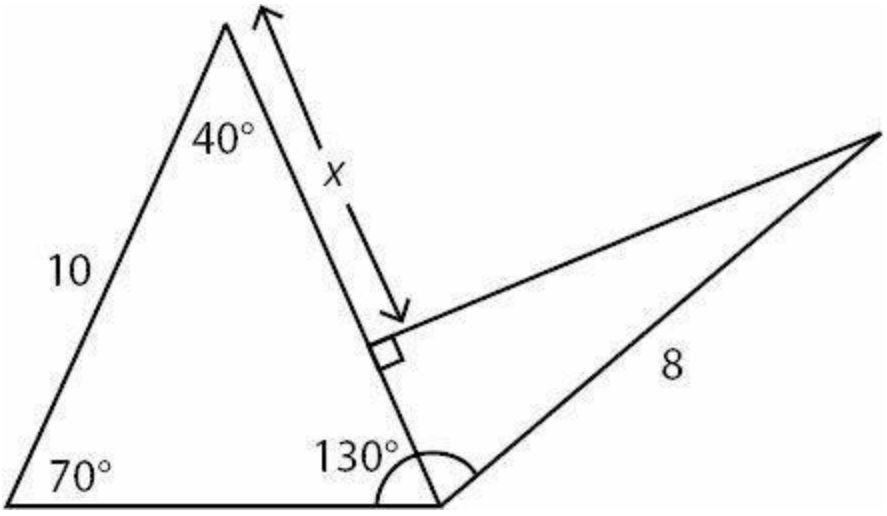
For questions in the Q uantitative C om parison form at ("Q uantity A " and "Q uantity B " given),the answ er choices are alw ays as follow s:

(A) Q uantity A is greater.
(B) Q uantity B is greater.
(C) The tw o quantities are equal.
(D) The relationship cannot be determ ined from the inform ation given.

For questions follow ed by a num eric entry box ☐,you are to enter your ow n answ er in the box.For questions follow ed by fraction-style num eric entry boxes ☐/☐,you are to enter your answ er in the form of a fraction.Y ou are not required to reduce fractions.For exam ple,if the answ er is 1/4,you m ay enter 25/100 or any equivalent fraction.

A ll num bers used are real num bers.A ll figures are assum ed to lie in a plane unless otherw ise indicated.G eom etric figures are not necessarily draw n to scale.Y ou should assum e,how ever,that lines that appear to be straight are actually straight,points on a line are in the order show n,and all geom etric objects are in the relative positions show n.C oordinate system s,such as *xy*-planes and num ber lines,as w ell as graphical data presentations such as bar charts,circle graphs,and line graphs, *are* draw n to scale.A sym bol that appears m ore than once in a question has the sam e m eaning throughout the question.

1.



Q uantity A	Q uantity B
x	6

2.

Q uantity A	Q uantity B
$(z^{6})^{x} \times z^{3x}$	Z^{9x}

3.

For a group of test takers,the scores on an aptitude test w ere norm ally distributed,had a m ean of 154,and a standard deviation of 3.

Q uantity A	Q uantity B
The fraction of test takers in the group w ho scored greater than 158	$\frac{1}{3}$

4.

$$3x + 5y + 2z = 20$$
$$6x + 4z = 10$$

Q uantity A	Q uantity B
y by itself	2

5.

R om ero A utom obiles sells cars only from M anufacturer X and M anufacturer Y .The range of the list prices of the cars from M anufacturer X is $22,000.The range of the list prices of the cars from M anufacturer Y is $15,000.

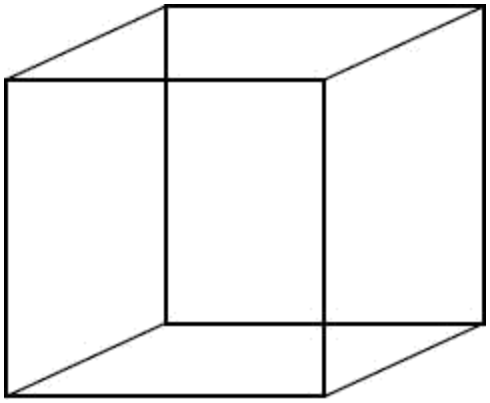
Q uantity A	Q uantity B
The range of the list prices of all autom obiles sold by R om ero A utom obiles	$22,000

6.

The operation # is defined by $x\# = \frac{1}{x} + x$

Q uantity A	Q uantity B
(4#)#	4.5

7.



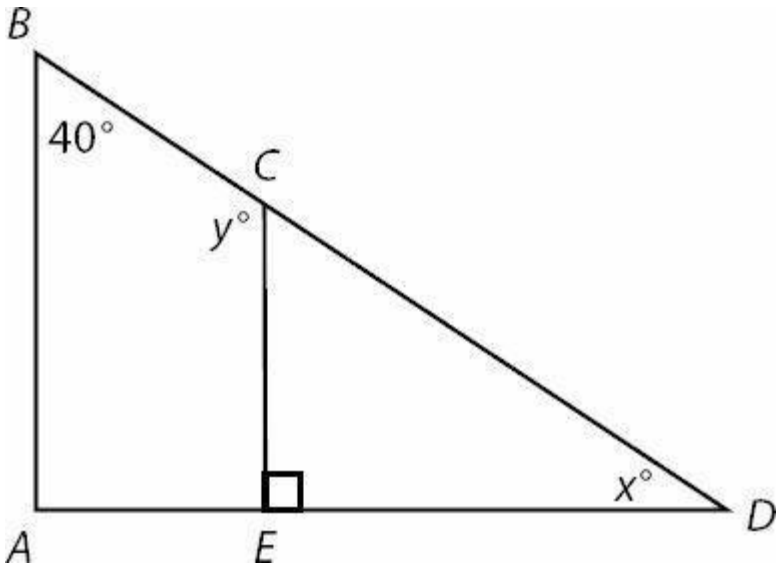
The cube above has side length of 4

Q uantity A	**Q uantity B**
A fter selecting one vertex of the cube,the num ber of straight line segm ents longer than 4 that can be draw n from that vertex of the cube to another vertex of the cube	W hen the cube is placed on a flat surface,the m axim um num ber of edges of the cube that can be touching the flat surface at once

8.If $160^2 = 16x$,then x is equivalent to w hich of the follow ing?

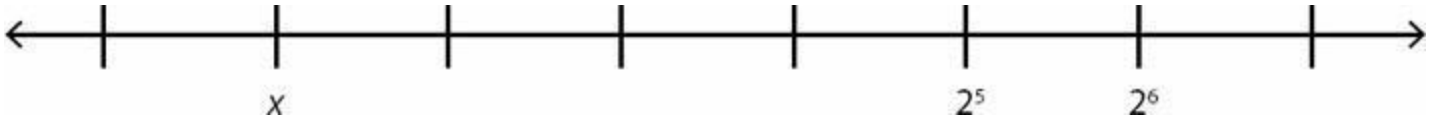
(A) 10
(B) $2^3 5$
(C) $2^2 5^2$
(D) $2^6 5^2$
(E) $2^6 5^3$

9.



In the triangle show n above,*BA* is parallel to *C E* .W hat is the value of $x + y$?

10.If the tick m arks on the num ber line below are evenly spaced,w hat value is represented by x?



(A) 2^0
(B) 2
(C) $(-2)2^5$
(D) $(-3)2^5$
(E) $(-4)2^5$

11.If the volum e of a cube is v,w hat is the surface area of the cube in term s of v?

(A) $6\sqrt{v}$
(B) $\left(\sqrt[2]{v}\right)^3$
(C) $6\left(\sqrt[2]{v}\right)^3$
(D) $\left(\sqrt[3]{v}\right)^2$
(E) $6\left(\sqrt[3]{v}\right)^2$

12.W hat is the area of an equilateral triangle w ith vertices at (-1,-3),(9,-3),and (m ,n) w here m and n are both positive num bers?

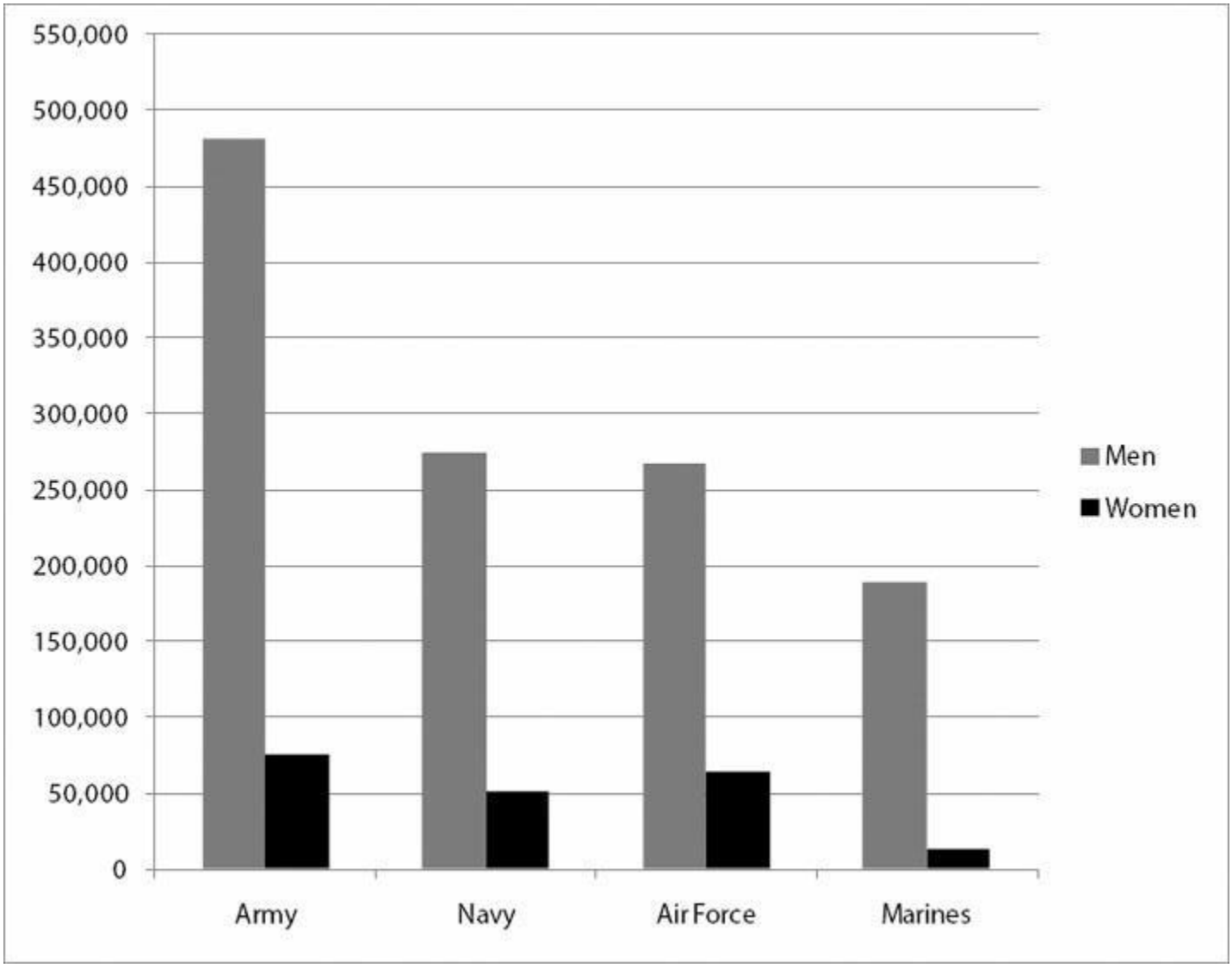
(A) $25\sqrt{2}$
(B) $50\sqrt{2}$
(C) $10\sqrt{3}$
(D) $25\sqrt{3}$
(E) $50\sqrt{3}$

Q uestions 13–15 are based on the follow ing charts.

M arital Status of M ilitary P ersonnel by G ender and B ranch

Marital Status		Army	Navy	Air Force	Marines
Single, no children less than 18 years old	men	164,513	107,349	94,800	90,949
	women	27,492	24,757	25,247	6,338
Single, with children less than 18 years old	men	26,571	10,506	9,544	4,807
	women	11,037	5,859	6,313	1,263
Married, spouse is also military personnel or retired military	men	15,058	8,638	20,760	4,719
	women	14,633	8,832	18,574	3,676
Married, spouse is a civilian	men	275,953	147,255	142,573	88,233
	women	21,687	11,175	13,982	1,858

N um ber of M ilitary P ersonnel by G ender and B ranch



13.W hich m ilitary branch has the greatest percentage of w om en w ho are single and have children under the age of 18?

(A) A rm y

(B) N avy

(C) A ir Force
(D) M arines
(E) It cannot be determ ined from the inform ation given.

14.If a m an w hose spouse is also m ilitary personnel or retired m ilitary w ere to be selected at random ,w hat w ould the probability be that he w as N O T in the A ir Force?

(A) 72%
(B) 58%
(C) 42%
(D) 24%
(E) 13%

15.W hich of the follow ing expressions is equal to the approxim ate num ber of w om en w ho w ould have to enlist in the A rm y to m ake the fraction of A rm y personnel w ho are w om en equal the fraction of A ir Force personnel w ho are w om en?

(A ssum e that the num ber of m en in the A rm y and the num ber of m en and w om en in the A ir Force rem ain unchanged from w hat is show n in the tables above.)

(A) $\frac{482,000-268,000}{75,000-64,000}$

(B) $\frac{(482,000)(64,000)-(75,000)(268,000)}{482,000}$

(C) $\frac{(482,000)(75,000)-(64,000)(268,000)}{482,000}$

(D) $\frac{(482,000)(75,000)}{268,000}-64,000$

(E) $\frac{(482,000)(64,000)}{268,000}-75,000$

16.A cable car travels from C ity X to R esortville,m aking tw o stops in betw een.B etw een C ity X and the first stop,the cable car travels $\frac{1}{3}$ of the total distance betw een C ity X and R esortville.B etw een the first stop and the second stop,the cable car travels $\frac{3}{5}$ of the rem aining distance betw een the first stop and R esortville.W hat fraction of the entire distance from C ity X to R esortville rem ains betw een the second stop and R esortville?

(A) $1-\frac{1}{3}-\frac{3}{5}$

(B) $1-\frac{1}{3}-\frac{3}{5}\left(\frac{1}{3}\right)$

(C) $1-\frac{1}{3}-\frac{3}{5}\left(1-\frac{1}{3}\right)$

(D) $1-\frac{1}{3}-\frac{1}{3}\left(1-\frac{3}{5}\right)$

(E) $1-\frac{1}{3}-\frac{1}{5}\left(1-\frac{1}{3}-\frac{1}{5}\right)$

17.If p and q are integers and $20p + 3q$ is odd,w hich of the follow ing m ust be odd?

(A) $p - q$
(B) $p + 2q$
(C) $3p + q$
(D) $2p + q^2$
(E) $3p + 3q$

18.4,400 participants in a study w ere surveyed regarding side effects of a new m edication,and x percent reported experiencing drow siness.If x is rounded to the nearest integer,the result is 8.W hich of the follow ing could be the num ber of survey participants w ho reported experiencing drow siness?

Indicate <u>all</u> such values.

☐ 325
☐ 330
☐ 352
☐ 375

19. $\frac{5^3(4^{45}-4^{43})27}{225^2}$ is equivalent to w hich of the follow ing?

(A) 4^{43}
(B) 4^{45}
(C) $4^{90}5^3$
(D) $4^{86}5^33^3$
(E) $4^{90}5^3\,3^3$

20.Price of Plane Ticket for an A pril 1 Flight B ased on D ate of Purchase

P rice	W hen P urchased B y
$210	M arch 31

$168	M arch 15
$140	M arch 1

H arpreet purchased a ticket on M arch 1st.If he had purchased the ticket on M arch 2nd,he w ould have paid *x* percent m ore.If he had purchased the ticket on M arch 16th,he w ould have paid *y* percent m ore than he w ould have paid on M arch 2nd.W hat is the positive difference betw een *x* and *y*?

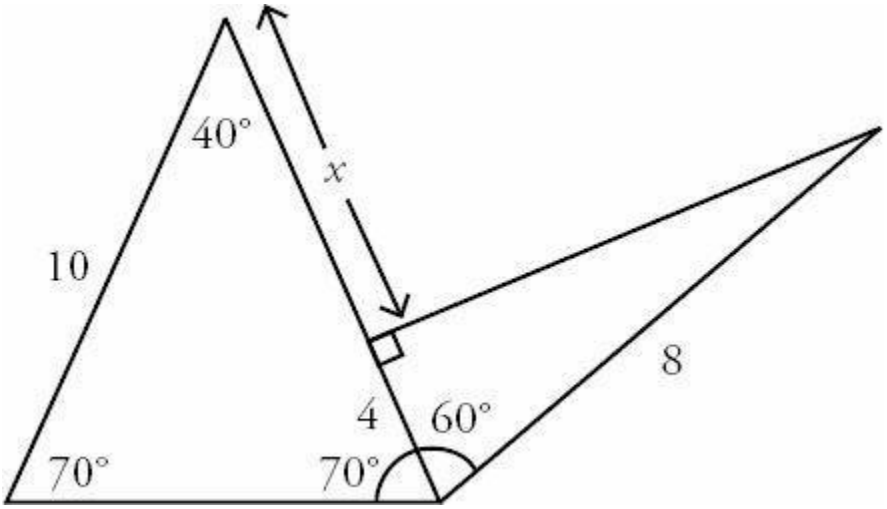
(A) 5
(B) 14
(C) 20
(D) 25
(E) 28

A nsw ers to M ath P ractice Section 3

1.**(C).**The leftm ost triangle has tw o angles labeled 40 and 70.Subtract these from 180 (the sum of the angles in any triangle) to determ ine that the third angle is 70.Subtract 130 - 70 = 60 to get the m easure of the adjoining angle in the rightm ost triangle.

Since the leftm ost triangle is isosceles,the tw o long sides are each equal to 10.

Since the rightm ost triangle is a 30–60–90 triangle,the sides are in the proportion $x : \sqrt{3}\, x : 2x$.B ecause the hypotenuse is 8 and also the 2*x* in the ratio,the shortest leg of this triangle is *x* = 4.



To calculate *x,*subtract: 10 - 4 = 6.The tw o quantities are equal.

2.**(C).**The term s in Q uantity A have the sam e base,so add the exponents: $(z^6)^x \times z^{3x} = z^{6x} \times z^{3x} = z^{9x}$.The tw o quantities are equal.N ote that $(z^6)^x$ is interchangeable w ith$(z^x)^6$ and z^{6x}.

3.**(B).**For a norm al distribution,approxim ately tw o thirds of the values are w ithin one standard deviation of the m ean. Thus,roughly 1/6 of the population is m ore than a deviation above the m ean,and 1/6 is m ore than a deviation below . Thus,about 1/6 of the test takers w ould score greater than 157 (154 + 3 = 157,one standard deviation above the m ean),so an even sm aller fraction of the test takers w ould score greater than 158.

4.**(A).**In order to isolate *y*,elim inate both *x* and *z*.B ecause there are only tw o equations,both *x* and *z* m ust be elim inated at the sam e tim e if the value of *y* is to be determ ined.

N otice that the coefficients for *x* and *z* in the second equation (6 and 4,respectively) are exactly double their coefficients in equation 1 (3 and 2,respectively).D ivide the second equation by 2,m aking the coefficients the sam e.

$3x + 5y + 2z = 20 \longrightarrow 3x + 5y + 2z = 20$
$6x + 4z = 10 \longrightarrow 3x + 2z = 5$

N ow subtract the second equation from the first.

$3x + 5y + 2z =$
$20 - (3x + 2z = 5)$
$5y = 15$
$y = 3$

Q uantity A is greater.

5.**(D).**The range of list prices of autom obiles is found by subtracting the price of the least expensive autom obile from the price of the m ost expensive autom obile.G iven just the range,there is not enough inform ation to determ ine the m axim um and m inim um list price vehicles from either m anufacturer.B efore selecting (D),though,you should try to prove (D).C onstruct tw o exam ples in w hich the list prices of the cars from M anufacturer X have a range of $22,000 and the list prices of the cars from M anufacturer Y have a range of $15,000,but the overall ranges are drastically different.

EX A M PLE 1:
List prices of M anufacturer X 's cars range from $10,000 to $32,000
List prices of M anufacturer Y 's cars range from $10,000 to $25,000
H ere,the overall range is the sam e as X 's range,w hich is $32,000 - $10,000 = $22,000

EX A M PLE 2:
List prices of M anufacturer X 's cars range from $10,000 to $32,000
List prices of M anufacturer Y 's cars range from $100,000 to $115,000
H ere,the overall range is $115,000 - $10,000 = $105,000

In Exam ple 1,the range = $22,000 and the quantities are equal.In Exam ple 2,Q uantity A is m uch greater than Q uantity B .It is not possible to m ake the range any sm aller than $22,000 (the m inim um range of all the prices cannot be *sm aller* than the larger of the tw o ranges of each m anufacturer's prices),but it can get m uch,m uch larger.

N ote that the testing done above w as very im portant! If Q uantity B had read "$21,999," the answ er w ould be (A) rather than (D).
The correct answ er is (D).

6.**(B).**Start inside the parentheses (according to PEM D A S,alw ays deal w ith parentheses first).

$$4\# = \frac{1}{4} + 4, \text{ or } \frac{17}{4}.$$

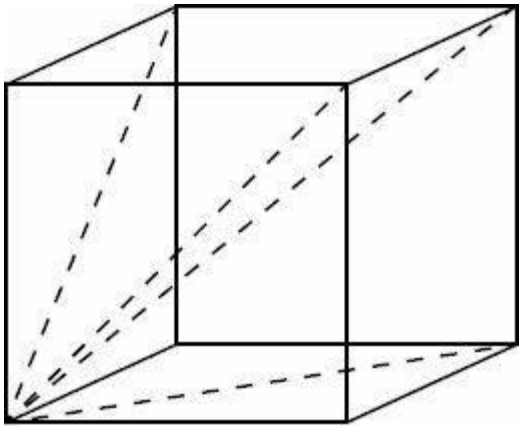
Since $4\# = \frac{17}{4}$, plug $\frac{17}{4}$ in for *x* to get (4#)#.

$$\text{Thus, } (4\#)\# = \frac{1}{\frac{17}{4}} + \frac{17}{4} = \frac{4}{17} + \frac{17}{4}$$

W hile you could find a com m on denom inator,it is m ore efficient to ballpark the value or sim ply use the calculator.

B allparking, $\frac{4}{\ }$ is less than 0.25 and $\frac{17}{\ }$ is exactly 4.25,so the sum is less than 4.5.U sing the calculator, $\frac{4}{\ } + \frac{17}{\ }$ is about 4.485.Q uantity B is greater.

7.**(C).**If a cube has side length of 4,all of the “straight line segm ents” connecting vertices of the cube *along an edge of the cube* w ill have length of 4.The only straight line segm ents betw een vertices that are longer than 4 are those that go diagonally through the cube or diagonally across a face.From a selected vertex of the cube,there are 3 diagonals across the adjacent faces of the cube,and 1 diagonal through the cube to the opposite vertex.



Thus,Q uantity A is 4.

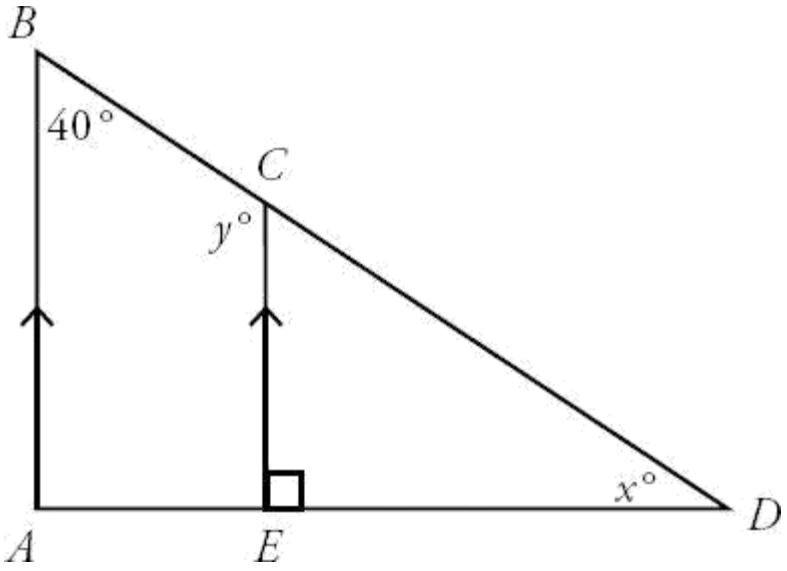
If a cube is placed on a flat surface,the m axim um contact occurs w hen one cube face abuts the surface— and thus 4 cube edges touch the surface.There is no w ay to m ake m ore than 4 cube edges touch the flat surface at once.The tw o quantities are equal.

8.**(D).**The easiest first step is to divide both sides by 16.To do that,m ake sure you separate out 160^2 first.N otice that $160^2 = 160 \times 160 = 16 \times 10 \times 160$:

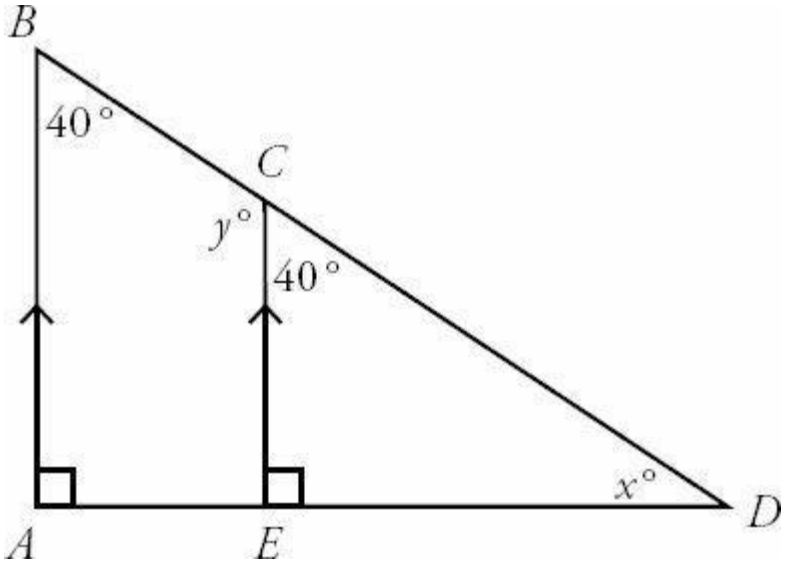
$16 \times 10 \times 160 = 16x$
$10 \times 160 = x$
$1{,}600 = x$

N one of the answ er choices m atch this,so break 1,600 dow n into its prim es ($1{,}600 = 100 \times 16 = 25 \times 4 \times 16 = 5^2 \times 2^2 \times 2^4 = 5^2 \times 2^6$) and see w hich choice is equivalent.A lternatively,m ultiply out the answ er choices to see w hich equals 1,600.The correct choice is (D).

9.**190.**R edraw the figure,labeling all inform ation given:



Since *BA* and *C E* are parallel,angle *B* and m inor angle *C* are equivalent,as show n:



The tw o angles that m eet at *C* m ake up a straight line,so they sum to 180 degrees:

180 = *y* +
40 *y* = 140

The three angles of triangle *C D E* m ust sum to 180 degrees,and so

180 = 40 + 90 + *x*
180 = 130 +
x x = 50

Therefore,*x* + *y* = 140 + 50 = 190.

10.**(D).**A t first glance,you m ight be tem pted to think that each tick m ark on this num ber line corresponds to a pow er of 2,but rem em ber that pow ers grow exponentially (i.e.the distance betw een 2^5 and 2^6 is not the sam e as the distance betw een 2^1 and 2^2),w hereas the tick m arks in the diagram are evenly spaced.So,start by finding the distance betw een 2^5 and 2^6.

$2^5 = 32$,and $2^6 = 64$.The difference betw een them is 32.That m eans the distance betw een each tick m ark on the num ber line is 32.So to get from 2^5 to *x*,"w alk back" or subtract four intervals of 32: 32 - 4(32) = -96.

M ultiply out the answ ers to see w hich one equals -96.O nly choice (D) w orks.

11.**(E).**There are tw o w ays to solve this question,w ith sm art num bers or algebra.Start w ith plugging-in.First,set a value for the volum e.In this case,pick a perfect cube,so the side length and all other values w ill be integers.The sm allest perfect cube (other than 1,w hich you should try never to use w hen doing plug-in questions) is 8.

A cube w ith a volum e of 8 has a side length of 2,m eaning each side has an area of 4.A cube has 6 sides,m aking the total surface area 24.(The equation for surface area is Surface A rea = $6s^2$).The answ er to this question is 24,based on these num bers.

Im m ediately elim inate any answ er choices that have the square root of 8,as the result w ill not be an integer.The answ er m ust be either (D) or (E).The cube root of 8 is 2.A nsw er choice (D) sim ply squares it,yielding 4.In answ er choice (E),that result is m ultiplied by 6,producing 24,w hich is the required answ er.Thus,the answ er is (E).

If you w anted to solve w ith algebra,you'd need to start by solving for a side of a cube w ith volum e *v*:

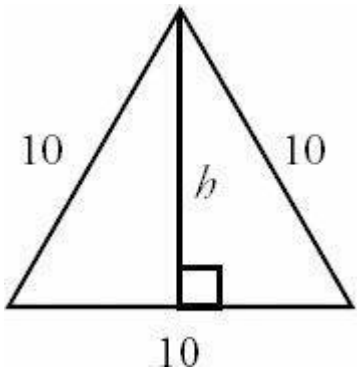
$$V = s^3 \quad \text{so} \quad s = (\sqrt[3]{v})$$

The equation for the surface area of a cube is $6s^2$.In this case,substitution for s results in exactly the expression w ritten in answ er choice (E).

12.**(D).**To find the area of an equilateral triangle w ith vertices at (-1,-3),(9,-3),and (*m* ,*n*),you do not need to find the values of *m* and *n.*To find the area of an equilateral triangle,you only need one side.So,you should first find the distance betw een (-1,-3) and (9,-3).

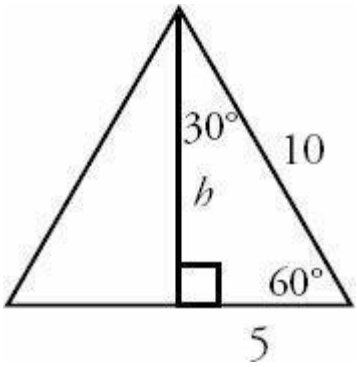
Since these tw o points are on a horizontal line together (they share a *y*-coordinate),the distance is just the difference betw een their *x*-coordinates: 9 - (-1) = 10.

A n equilateral triangle w ith side 10 w ill have the sam e area regardless of w here it is placed on an *xy*-coordinate plane, so the location of *m* and *n* is irrelevant.Instead,draw an equilateral triangle w ith sides equal 10.D rop a height dow n the m iddle.10



D ividing a 60–60–60 triangle in this w ay creates tw o 30–60–90 triangles.The bottom side of the triangle is bisected

by the height:



U sing the properties of 30–60–90 triangles,*h* is equal to the shortest side m ultiplied by the square root of 3.Thus, $h = 5\sqrt{3}$.(Y ou m ay also w ish to m em orize that the height of an equilateral triangle is *alw ays* equal to half the side m ultiplied by $\sqrt{3}$.)
Find the area of the triangle,using 10 as the base:

$$A = \frac{bh}{2} = \frac{10(5\sqrt{3})}{2} = 25\sqrt{3}$$

13.**(A).**The percentage of w om en in a service w ho are single m others is:

$$\frac{\#\text{ single women with children}}{\#\text{ women}}$$

Find the num ber of single m others in each of the four services by looking at the first table,***M artial Status of M ilitary Personnel by G ender and B ranch.***The num ber of w om en w ho are single w ith children is given as:

A rm y 11,037
N avy 5,859
A ir Force 6,313
M arines 1,263

There are tw o w ays to find the total num ber of w om en in each service,though.Either sum the exact num ber of w om en in each branch of the service across each of the m arital status' given in the first chart,or read an approxim ate num ber of w om en from the second bar chart,***N um ber of M ilitary Personnel by G ender and B ranch***,then only bother to sum from the detailed chart if tw o answ ers are very close to each other.

Since using the chart w ill be faster and G R E problem s are designed to be solved quickly,try approxim ating from the bar chart first.The total num ber of w om en in each of the four services is approxim ately

A rm y 75,000
N avy 50,000
A ir Force 60,000

M arines 10,000

C alculate the approxim ate percent of w om en w ho are single m others in each branch of the service.

A rm y	11,000/75,000 = about 14.7%
N avy	5,900/50,000 = about 11.8%
A ir Force	6,300/60,000 = about 10.5%
M arines	1,300/10,000 = about 13%

The percent looks highest in the A rm y.A t least,reason that the num ber of single m others in the A rm y is about double the num ber of single w om en in either the N avy or A ir Force,yet the total num ber of w om en in the A rm y is definitely less than double the total num ber of w om en in either the N avy or A ir Force,m aking their percentage of w om en greater in the A rm y.

Just quickly check the actual totals for the A rm y and the M arines.

A rm y: single m others = 11,037 and total w om en = 74,849.The percent is 14.7% .
M arines: single m others = 1,263 and total w om en = 13,135.The percent is 9.6% .

Thus,the A rm y has the greatest percentage of w om en w ho are single and have dependents under the age of 18.

14.**(B).**The probability that a m an w hose spouse is also m ilitary personnel or retired m ilitary is N O T in the A ir Force is given by the form ula:

$$\frac{\#\text{ of men in the "married, military spouse" category who are NOT in the Air Force}}{\text{total \# men in the "married, military spouse" category}}$$

A ll of the inform ation needed to calculate both of these num bers is in the first table,***M artial Status of M ilitary Personnel by G ender and B ranch.***

The total num ber of m en m arried to a m ilitary spouse or retired m ilitary in each of the four services:

15,058 + 8,638 + 20,760 + 4,719 = 49,175

Then just subtract the num ber of A ir Force m en in this category to get the num ber of m en in such m arriages w ho are not in the A ir Force:

49,175 - 20,760 = 28,415

A nd finally:

$$\frac{28,415}{49,175} = 0.5778 \approx 58\%$$

15.**(E).**In order to solve this problem ,m ake the tw o ratios equal.The ratio in question is W om en/Total,but W om en/M en is sim pler and w orks also,because Total depends only on W om en and M en):

$$\frac{\text{resulting \# of women in Army}}{\text{\# of men in Army}} = \frac{\text{\# of women in Air Force}}{\text{\# of men in Air Force}}$$

There are tw o w ays to find the num ber of w om en and m en in the A rm y and A ir Force.Either sum the exact num ber of w om en and m en in each m arital status for each branch of the service in question,or read an approxim ate num ber from the second bar chart,***N um ber of M ilitary Personnel by G ender and B ranch.***

Since the problem says to approxim ate and gives num bers in the answ er choices that can serve as guidelines, approxim ation from the bar chart w ill be good enough.

The im portant thing is to focus on the *structure* of the m ath.Since adding w om en to the A rm y w ill change the num ber of w om en in the A rm y,use a variable to represent the additional w om en.Let *x* represent the num ber of w om en w ho w ould have to enlist in the A rm y in order to m ake the ratios equal.

$$\frac{\text{current \# of women in Army} + x}{\text{\# of men in Army}} = \frac{\text{\# of women in Air Force}}{\text{\# of men in Air Force}}$$

From the bar chart,look up the approxim ate num bers:

	A rm y	A F
# of w om en	75,000	60,000
# of m en	475,000	270,000

The next step is to plug these approxim ate num bers into the equation and solve for *x*.

$$\frac{75{,}000 + x}{475{,}000} = \frac{60{,}000}{270{,}000}$$

$$\rightarrow 75{,}000 + x = 475{,}000 \times \frac{60{,}000}{270{,}000}$$

$$\rightarrow x = 475{,}000 \times \frac{60{,}000}{270{,}000} - 75{,}000$$

Looking at the answ er choices,structurally,the answ er m ust be (D) or (E),and the num bers in (E) are a better fit to the num bers approxim ated from the chart.

16.**(C).**Since the question concerns the “fraction of the entire distance from C ity X to R esortville,” think of the entire distance as equal to 1.B etw een C ity X and the first stop,the cable car travels $\frac{1}{3}$,leaving $\frac{2}{3}$ left to travel.

B etw een the first stop and the second stop,the cable car travels $\frac{3}{5}$ of the rem aining $\frac{2}{3}$, or $\frac{3}{5}\times\frac{2}{3}=\frac{2}{5}$.

So far,the cable car has gone $\frac{1}{3}+\frac{2}{5}=\frac{11}{15}$.Thus,the rem aining distance is $1-\frac{11}{15}=\frac{4}{15}$.O nly choice (C) is equal to $\frac{4}{15}$,although this takes som e m anipulation of the choices to check.

A lternatively,construct a form ula.The first leg of the journey leaves $1-\frac{1}{3}$ left to travel.The second leg of the journey subtracts another $\frac{3}{5}$ of the rem aining $1-\frac{1}{3}$,or $\frac{3}{5}\left(1-\frac{1}{3}\right)$.Thus,the correct expression is $1-\frac{1}{3}-\frac{3}{5}\left(1-\frac{1}{3}\right)$.

17.**(D).**If *p* and *q* are integers,then 20*p* is even regardless of w hether *p* is even or odd.Since 20*p* + 3*q* is odd,3*q* m ust be odd.If 3*q* is odd,then *q* is odd.Thus,*q* is odd,but *p* could be odd or even.The correct answ er m ust be odd regardless of w hether *p* is odd or even.

If *p* is odd,(A) is even,(B) is odd,(C) is even,(D) is odd,and (E) is even.Since the correct answ er choice is the one that *m ust* be odd,only (B) and (D) are possibilities.

If *p* is even,(B) is even and (D) is odd.Thus,choice (D) is definitely odd and is the correct answ er.

18.**II and III only (330 and 352).**U sing your calculator,convert each choice to a percent,and determ ine w hether that percent w ould round up or dow n to 8% .

The first choice $=\frac{325}{4,400}\times 100=7.386\ldots\%$ This num ber w ould round dow n to 7% ,not up to 8% .

The second choice $=\frac{330}{4,400}\times 100=7.5\%$ This num ber rounds up to 8% ,and thus this choice is correct.

The third choice $=\frac{352}{4,400}\times 100=8\%$ exactly,and thus this choice is correct.

The fourth choice $=\frac{375}{4,400}\times 100=8.522\ldots\%$ This num ber w ould round up to 9% ,not dow n to 8% .

19.**(A).**W hen dealing w ith exponents,try to get (alm ost) everything in term s of com m on prim e bases.Since all the answ er choices have a base 4,leave those term s alone for now .

5^3 is already sim plified
$27 = 3^3$ $225^2 = 25^2 \times 9^2 = (5^2)^2 \times (3^2)^2 = 5^4 \times 3^4$

R eplacing all of these in the equation,you get this: $\frac{5^3(4^{45}-4^{43})3^3}{5^4 3^4}$

C ancel 5's and 3's in the top and bottom : $\frac{(4^{45}-4^{43})}{5\times 3}=\frac{(4^{45}-4^{43})}{15}$

Factor 4^{43} out of both term s in the num erator and sim plify: $\frac{4^{43}(4^2-4^0)}{15}=\frac{4^{43}(16-1)}{15}=\frac{4^{43}(15)}{15}=4^{43}$

20.**(A).**O n M arch 1st,the ticket cost $140.If he had purchased it on M arch 2nd,H arpreet w ould have paid $168, w hich is $28 m ore.To find *x*,use the percent change form ula:

$$\text{Percent Change} = \left(\frac{Difference}{Original}\times 100\right)\% = \left(\frac{28}{140}\times 100\right)\% = 20\%$$

Thus,*x* = 20.If he had purchased the ticket on M arch 16th,he w ould have paid $210,w hich is $42 m ore than the $168 he w ould have paid on M arch 2nd.

$$\text{Percent Change} = \left(\frac{Difference}{Original}\times 100\right)\% = \left(\frac{42}{168}\times 100\right)\% = 25\%$$

Thus,*y* = 25 and the positive difference betw een *x* and *y* is 5.("Positive difference" just m eans to subtract the sm aller one from the bigger one,or to subtract either one from the other and then take the absolute value.)